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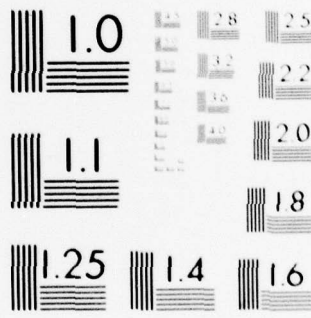
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VITAMIN ASSAY DATA ON FOOD SAMPLES OBTAINED FROM NAVAL AIR STAT--ETC(U)
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VITAMIN ASSAY DATA ON FOOD SAMPLES
OBTAINED FROM NAVAL AIR STATION,
ALAMEDA, CA AND MARINE CORPS BASE,
TWENTYNINE PALMS, CA: THIAMIN,
RIBOFLAVIN AND VITAMIN B-6.

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ABSTRACT

Over 300 samples representing 174 food items were collected from the serving lines at the Naval Air Station, Alameda, California and the Marine Corps Base, Twentynine Palms, California. Results of thiamin, riboflavin and vitamin B-6 analyses are presented here. Most of this information is not available in the current literature. In contrast to previous reports of vitamin contents of foods, this study emphasized prepared food items on an "as served" basis.

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PREFACE

The authors would like to acknowledge the following persons who contributed to the completion of this study:

H.L. Johnson, Ph.D. and J.H. Skala, Ph.D., who were responsible for planning, executing and overseeing the survey project;

M.L. Henderson, C.M. Lewis and J.M. McDonnell, who provided technical assistance; and

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INTRODUCTION

An effort made by the U.S. Department of Defense to provide a nutritious, appetizing diet for members of the Armed Forces has resulted in surveys to determine the nutrient content of foods served in military dining halls. This report summarizes thiamin, riboflavin, and vitamin B-6 contents of 174 food items sampled from the serving lines of two such dining facilities.

Food sources of thiamin, riboflavin, and vitamin B-6 have been widely investigated and reported (1-5). However, few of these studies have emphasized the nutrient content of foods as they are served or consumed. Such information is particularly relevant in military and other public dining facilities which tend to make maximal use of facilities and shortened labor hours. As pointed out by Engler and Bowers (6), many foods are, therefore, held after they are prepared; in fact, it is not uncommon to find in these dining facilities that, before serving, cooked items are held in warming devices or reheated after having been prepared and refrigerated. Such reheating processes may result in increased losses of B-vitamins, since most are sensitive to light and oxygen.

MATERIALS AND METHODS

Sample Collection and Preparation Over 300 food samples were collected from two military installations (Alameda Naval Air Station, August 1976, and Twentynine Palms Marine Corps Base, March 1977). The samples were taken from items served for breakfast, lunch, dinner, and brunch and represented as a total entity all meals served for fourteen consecutive days in the dining halls of the installations. At least one generous serving of each sample was collected directly from the serving lines and placed in plastic containers and packed in dry ice for transport. In the laboratory, the samples were thawed and inedible portions such as bones and seeds were removed. Each item was homogenized in a blender with a sufficient but known amount of water added to obtain a uniform sample. The samples were then acidified (2.5 ml. concentrated hydrochloric acid per 100 gm. sample) and stored at -20°C in the dark. Portions of several different food items were combined to give a composite which was divided into aliquots for purpose of quality control. Each batch of analyses included "composites" with and without added standards in order to obtain estimates of recovery and between-run precision. Before analyses, the samples were thawed overnight in a refrigerator and each was mixed well before a portion was removed for assay.

Analyses. Thiamin and riboflavin analyses were carried out by the microbiological methods described by Pearson (7,8). The assay

microorganisms were L. viridescens (ATCC 12706) and L. casei (ATCC 7469) for thiamin and riboflavin analyses, respectively. The assay procedure for the determination of vitamin B-6, as outlined by Sauberlich (9), utilized the microorganism S. uvarum (ATCC 9080), formerly called S. carlbergensis. This yeast is able to utilize all active forms of vitamin B-6 for its growth.

Assay media used in this study were purchased from Difco Laboratories (Detroit, Michigan, USA). Stock standards (USP reference standards from U.S. Pharmacopoeial Convention, Inc., New York, New York, USA) were prepared at a concentration of 100 µg. per milliliter, in accordance with the procedures outlined in the above references.

In all cases, at least three dilutions of each sample aliquot were prepared for microbiological assay. These dilutions were carefully adjusted so that the majority of the data obtained from them fell into the optimal range of the corresponding standard curve which was included with each daily run. Furthermore, only data from those daily assays with acceptable quality control parameters were used. If the recovery of added standard for a given batch of analyses was not between 80 and 120 per cent, that group was repeated. Final calculations included adjustments for any water added during homogenization and the data were expressed in terms of mg. vitamin per 100 gm. food items "as served."

RESULTS AND DISCUSSION

Table 1 shows the thiamin, riboflavin, and vitamin B-6 contents of the edible portions of 174 food items "as served." Many of these food items were sampled in the field two or more times; each sample was collected on a different day. The ranges of values of these multiple (300) samples have been included in the table immediately below their mean values. The ranges are useful for gaining insight into those items which are most variable in nutrient content from one meal (or recipe) to another. To verify that these ranges were not due to experimental error, all samples with questionable values were reanalyzed in addition to a number of other food items randomly selected.

Some of the nutrient data listed in the table are based on analysis of only one sample. (For example, the item may have appeared on the menu only once during the survey.) Nevertheless, they have been included since we feel one value is better than none.

An effort was made to compare the values in Table 1 with available published data. Ninety per cent of the vitamin B-6 values and 35 per cent of the thiamin and riboflavin data are not available in the current literature. Some of the nutrient values obtained in this study are also found different from those of other workers (1-5).

Vitamins such as thiamin and other heat-labile vitamins are more variable than other nutrients. As was pointed out by McCance and

Widdowson (4), this variability is partly caused by a real difference between samples of the same food item. For example, in the case of meat products, the vitamins are likely to be affected by the food given to the animal and by the portion of fat in the sample; and in the case of fruits and vegetables these nutrients may be influenced by climate or soil, degree of maturity, and methods of storage and processing. Part of the variability is due also to differences in techniques such as methods of collecting samples, styles of cooking, and analytical procedures used to determine the vitamins. Another factor is that many laboratories have examined raw ingredients rather than having made an effort to analyze "table-ready" food items. Nutrient values for raw foods tend to be higher than those for foods after cooking and/or holding. This is particularly true for water-soluble vitamins. Furthermore, thiamin is heat-labile; and although riboflavin and pyridoxine are more stable to heat, they are affected by exposure to light and oxygen.

Because of potential vitamin destruction during food preparation, it is important to estimate nutrient content of food items "as served." Such information has now become increasingly relevant in public dining facilities such as those in military installations, which tend to use standardized methods to prepare and cook foods.

CONCLUSIONS

Information on thiamin, riboflavin, and vitamin B-6 contents is presented for 174 food items which represent over 300 samples collected from serving lines in dining halls of two military installations. Ninety per cent of the vitamin B-6 values and thirty-five per cent of the thiamin and riboflavin data are not available in the current literature. In contrast to most previously published data, the emphasis in this study was on the vitamin contents of prepared food items on an "as served" basis.

REFERENCES

- (1) WATT, B.K. and MERRILL, A.L.: Composition of Foods - Raw, Processed, Prepared. Rev. USDA Agric. Handbook No. 8, 1963.
- (2) ORR, M.L.: Pantothenic Acid, Vitamin B₆ and Vitamin B₁₂ in Foods. USDA Home Econ. Res. Report No. 36, 1969.
- (3) BOWES, A.D. and CHURCH, C.F.: Food Values of Portions Commonly Used. 11th ed. Philadelphia: J.B. Lippincott Co., 1970.
- (4) McCANCE, R.A. and WIDDOWSON, E.M.: The Composition of Foods. Rev. Medical Res. Council Special Report Series No. 297. Her Majesty's Stationery Office, London, 1960.
- (5) CHATFIELD, C.: Food Composition Tables - Minerals and Vitamins for International Use. Food and Agric. Organization of the United Nations. FAO Nutritional Studies No. 11, 1954.
- (6) ENGLER, P.P. and BOWERS, J.A.: Vitamin B₆ in reheated, held, and freshly cooked turkey breast. J. Am. Dietet. A. 67: 42, 1975.
- (7) PEARSON, W.N.: Thiamin. In GYORGY, P. and PEARSON, W.N. eds.: The Vitamins, 2nd ed. N.Y.: Academic Press, Inc., 1967.
- (8) PEARSON, W.N.: Riboflavin. In: The Vitamins. ibid.
- (9) SAUBERLICH, H.E.: Vitamin B₆. In: The Vitamins. ibid.

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APPENDIX

Table 1
Thiamin, riboflavin, and vitamin B-6 contents of
edible portions of food items "as served"*

FOOD ITEM AND DESCRIPTION [†]	REF. TO [‡] RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item					
			mg./100 gm.		
Biscuits, baking powder (12 lbs enriched flour; 2 7/8 cups milk, nonfat, dry; 1 1/2 cups baking powder)	D-1(2)	2	0.506 (0.464-0.547)	0.276 (0.274-0.277)	0.029 (0.028-0.030)
Bread					
Cornbread, southern style (31 lbs enriched flour; 3 3/4 qts corn meal; 10 oz milk, nonfat, dry; 20 eggs, whole)	D-14	2	0.465 (0.256-0.674)	0.263 (0.239-0.287)	0.081 (0.064-0.098)
French, garlic toasted (12 lbs bread, French, sliced; 2 qts margarine, melted; 4 tbsp garlic, dry, minced)	D-7	3	0.584 (0.452-0.673)	0.357 (0.181-0.678)	0.027 (0.000-0.060)
French, toast (bread, French, cut; egg washed; dipped in eggs, whole, beaten; slices browned slightly on each side on greased 375°F griddle)	D-7(2)	4	0.344 (0.222-0.457)	0.452 (0.264-0.579)	0.036 (0.023-0.058)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Bread (continued)					
White (1/4 cup yeast, active, dry; 1 3/4 cups milk, nonfat, dry; 7 lbs 12 oz enriched flour)	D-8(2)	3	0.881 (0.872-0.898)	0.577 (0.560-0.594)	0.035 (0.018-0.054)
Whole wheat (1/4 cup yeast, active, dry; 1 3/4 cups milk, nonfat, dry; 6 lbs 8 oz enriched flour; 12 oz wheat base)	D-10(1)	1	0.702	0.449	0.105
Cake					
Applesauce (18 eggs, whole; 3 lbs 6 oz apple- sauce, canned; 4 1/2 cups raisins; 3 lbs 4 oz flour)	G-2	4	0.110 (0.060-0.220)	0.160 (0.117-0.202)	0.050 (0.017-0.109)
Gingerbread (4 lbs flour; 4 tbsp ginger, ground; 3 lbs molasses; 12 eggs, whole)	G-17(1)	2	0.267 (0.207-0.327)	0.146 (0.130-0.162)	0.012 (0.000-0.023)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Cake (continued)					
Peanut butter (3 lbs cake flour; 1 cup milk, nonfat, dry; 5 1/4 cups peanut butter; 20 eggs, whole; 6 tbsp vanilla)	G-20	2	0.300 (0.280-0.320)	0.258 (0.258-0.259)	0.165 (0.160-0.170)
Pineapple upside down (25 cups pineapple, canned; 5 1/2 qts yellow cake batter; 3 cups butter)	G-29(2)	1	0.146	0.085	0.030
Pound (4 lbs flour; 10 1/2 cups milk, nonfat, dry; 30 eggs, whole; 4 tbsp vanilla)	G-21(2)	2	0.216 (0.163-0.268)	0.126 (0.069-0.182)	0.022 (0.017-0.028)
Strawberry shortcake (7 lbs pastry flour; 1 1/2 cups milk, nonfat, dry; 1 cup butter, melted; 20 lbs strawberries, frozen)	G-16(1)	1	0.070	0.202	0.040

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Cereal					
Farina, quick-cooking type (cooking time: 2 to 5 minutes)	E-2	1	0.118	0.137	0.007
Fried oatmeal mush (5 lbs quick-cooking rolled oats; 1/2 cup butter; cooking time for pre-fried oatmeal: 1 minute)	E-11-3	1	0.085	0.083	0.000
Cookies					
Butterscotch brownies (3 1/2 cups butter, melted, hot; 20 eggs, whole; 3 lbs pastry flour; 1 1/2 qts nuts, chopped)	H-3(2)	2	0.242 (0.214-0.269)	0.198 (0.171-0.225)	0.230 (0.155-0.305)
Sugar (10 eggs, whole; 3 tbsp vanilla; 1/4 cup milk, nonfat, dry; 4 lbs 12 oz flour)	H-27	1	0.372	0.256	0.056

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
			mg./100 gm.		
Doughnut, cake type with sugar icing "sugar coated doughnut" (4 lbs bread flour; 6 lbs pastry flour; 1 1/3 cups milk, nonfat, dry; 24 eggs, whole; 2 tbsp vanilla)	D-18(1)-9	1	0.616	0.521	0.027
Macaroni and cheese, baked (8 lbs macaroni; 1 3/4 qts milk, nonfat, dry; 3 cups butter, melted; 1 lb 2 oz pastry flour; 6 qts cheese, ground; 1 qt bread crumbs)	F-1(2)	5	0.214 (0.091-0.296)	0.168 (0.068-0.250)	0.023 (0.012-0.034)
Muffins, plain (9 lbs enriched flour, wheat, soft; 25 eggs, whole; 3 1/2 cups milk, nonfat, dry)	D-30	2	0.384 (0.304-0.464)	0.177 (0.152-0.201)	0.019 (0.000-0.038)
Noodles					
Chow mein, canned		2	0.934 (0.559-1.310)	0.338 (0.184-0.491)	0.069 (0.066-0.073)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Noodles (continued)					
Egg, enriched		3	0.181 (0.162-0.217)	0.157 (0.124-0.220)	0.007 (0.000-0.021)
Pancakes (9 lbs pastry flour, enriched; 4 1/2 cups milk, nonfat, dry; 35 eggs, whole)	D-25(2)	2	0.323 (0.306-0.340)	0.504 (0.444-0.563)	0.020 (0.014-0.026)
Pie					
Apple, canned prepared filling (28 lbs apple pie filling, prepared, canned; 1 1/2 cups butter; 17 pie shells, unbaked)	I-53	1	0.169	0.112	0.031
Blueberry, canned prepared filling (same as for apple pie above)	I-53-1	3	0.159 (0.136-0.185)	0.111 (0.084-0.130)	0.037 (0.028-0.045)
Chocolate cream (17 pie shells, baked; 1 3/4 qts milk, nonfat, dry; 1 qt cocoa; 24 eggs, whole; 4 tbsp vanilla; 3 cups butter; 4 3/4 cups cornstarch)	I-28	2	0.156 (0.155-0.157)	0.205 (0.161-0.250)	0.027 (0.025-0.029)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Pie (continued)					
Coconut cream (17 pie shells, baked; 5 1/2 cups milk, nonfat, dry; 2 lbs 8 oz prepared sweetened coconut, chopped; 30 eggs, whole)	I-50(1)-2	1	0.213	0.173	0.011
Lemon Meringue (cornstarch) (17 pie shells, baked; 1 cup lemon rind, grated; 1 1/2 qts cornstarch; 20 eggs, whole; 5 1/2 cups juice, lemon; 2 cups butter)	I-33(1)	1	0.059	0.067	0.010
Peach (pregelatinized starch) (17 pie shells, unbaked; 3 gals peaches, canned, sliced; 3 1/2 cups starch, pregelatinized; 1 gal juice, peach)	I-36	1	0.083	0.046	0.023

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Pie (continued)					
Pineapple chiffon (17 pie shells, baked; 1 1/2 qts pineapple, canned, crushed; 3 lbs 12 oz dessert powder, gelatin, lemon; 3/4 cup milk, nonfat, dry)	I-43(1)	1	0.077	0.087	0.019
Pumpkin (17 pie shells, unbaked; 2 cups flour; 4 1/2 cups milk, nonfat, dry; 13 lbs 4 oz pumpkin; 30 eggs, whole)	I-45	3	0.129 (0.069-0.191)	0.184 (0.106-0.233)	0.057 (0.030-0.075)
Pizza, cheese and Italian sausage (1 gal pizza sauce; 1/4 cup yeast, active, dry; 4 3/4 qts bread flour; 48 slices cheese, Mozzarella, natural; 4 cups cheese, grated, Parmesan; 3 lbs sausage, chopped)	D-31(1)-6	2	0.193 (0.172-0.214)	0.150 (0.145-0.154)	0.108 (0.102-0.114)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Continued					
mg./100 gm.					
Pudding, bread (with raisins) (2 1/4 qts raisins; 4 lbs bread, day old 1/2 inch cubes; 30 eggs, whole; 1 3/4 qts milk, nonfat, dry; 4 tbsps vanilla)	J-16(1)	1	0.123	0.210	0.012
Rice					
Fried, with pork and eggs (oven method) (9 lbs rice; 1 3/4 qts onions, dry, finely chopped; 4 1/2 cups peppers, sweet, fresh, finely chopped; 4 1/2 cups celery, fresh, finely chopped; 20 eggs, whole; 4 lbs meat, cooked, diced)	E-7(1)	4	0.165 (0.092-0.300)	0.180 (0.049-0.389)	0.127 (0.060-0.233)
White, steamed	E-5	1	0.135	0.075	0.024
Rolls, sweet (1 1/2 cups yeast, active, dry; 18 eggs, whole; 2 1/2 gals bread flour; 1 cup milk, nonfat, dry)	D-36(2)	1	0.902	0.622	0.107

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Cereal-based Item - Concluded					
			mg./100 gm.		
Spaghetti with meatball sauce (cooking time for spaghetti: about 15 minutes)	E-4	4	0.125 (0.058-0.239)	0.088 (0.046-0.120)	0.185 (0.115-0.296)
Waffles, baked (same as for pancake above)	D-25(2)	2	0.480 (0.295-0.665)	0.664 (0.562-0.765)	0.038 (0.037-0.040)
Eggs and Dairy					
			mg./100 gm.		
Cottage cheese, plain		1	0.038	0.238	0.014
Custard, baked (1 3/4 qts milk, nonfat, dry; 60 eggs, whole; 4 tbsp vanilla; 1 tbsp nutmeg, ground)	J-14	1	0.048	0.259	0.032

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Eggs and Dairy - Continued					
mg./100 gm.					
Eggs, chicken					
Egg foo young (3 cups onions, dry, finely chopped; 1 cup peppers, sweet, fresh, finely chopped; 4 lbs meat, pork, cooked, chopped; 3 lbs bean sprouts, canned, drained; 60 eggs, whole; 1 gal stock, beef, hot; 2 cups flour)	F-9	1	0.123	0.456	0.080
Fried (griddle)	F-10(2)	2	0.102 (0.080-0.124)	0.537 (0.435-0.638)	0.082 (0.075-0.090)
Omelet with cheese, fried (200 eggs, whole; 3 qts ground cheese, approximately 2 tbsp per 2-egg omelet)	F-11(1)-2	1	0.292	0.674	0.087
Ice milk, chocolate		1	0.063	0.218	0.013

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Eggs and Dairy - Concluded					
mg./100 gm.					
Milk					
Cow, chocolate (2% fat; vitamins A and D, and protein fortified)		2	0.052 (0.044-0.060)	0.146 (0.144-0.147)	0.034 (0.030-0.037)
Cow, whole (vitamin D fortified)		2	0.042 (0.038-0.045)	0.218 (0.140-0.296)	0.028 (0.023-0.032)
Fruits and Juices					
mg./100 gm.					
Apple(s)					
Juice, canned		1	0.000	0.000	0.022

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Fruits and Juices - Continued					
mg./100 gm.					
Banana(s)					
Raw					
Cantaloupe(s)					
Raw					
Cranberries					
Sauce					
Grape(s)					
Juice, canned					
Raw					

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Fruits and Juices - Continued					
mg./100 gm.					
Grapefruit(s)					
Juice, canned, sweetened		1	0.072	0.039	0.020
Raw		1	0.090	0.033	0.066
Honeydew melon(s)					
Raw		1	0.095	0.016	0.066
Orange(s)					
Juice, canned, sweetened		1	0.087	0.044	0.088
Raw, peeled		1	0.161	0.069	0.070
Peach(es)					
Raw		1	0.024	0.053	0.015
Plum(s)					
Raw, damson		1	0.043	0.096	0.090

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Fruits and Juices - Continued					
mg./100 gm.					
Salads					
Cottage cheese and apricot (1 1/2 gals cottage cheese; 13 lbs 8 oz canned apricots)	M-13(2)-1	1	0.023	0.211	0.022
Cottage cheese and peach (1 1/2 gals cottage cheese; 13 lbs 8 oz peaches, canned, halves)	M-13(2)	2	0.029 (0.028-0.031)	0.185 (0.151-0.220)	0.022 (0.018-0.027)
Jellied banana (3 lbs dessert powder, gelatin, fruit flavor; 10 lbs bananas, fresh, peeled; 4 lbs lettuce, fresh, trimmed)	M-22	1	0.018	0.014	0.011
Jellied carrots and pineapples "Golden Glow" (2 lbs 8 oz dessert powder, gelatin, lemon flavor; 3 lbs 8 oz carrots, fresh, finely diced; 6 lbs 14 oz pineapple, canned, crushed; 4 lbs lettuce, fresh, trimmed)	M-20	2	0.018 (0.018-0.019)	0.014 (0.013-0.016)	0.011 (0.008-0.014)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Fruits and Juices - Concluded					
mg./100 gm.					
Salads (continued)					
Jellied fruit cocktail (1 1/2 gals fruit cocktail, canned; 3 lbs dessert powder, gelatin, fruit flavor; 3 cups juice, lemon; 1 lb walnuts, coarsely broken)	M-26(2)	2	0.026 (0.022-0.030)	0.015 (0.015-0.015)	0.000 (0.000-0.000)
Jellied pear (13 lbs 4 oz pears, canned, halves; 3 lbs dessert powder, gelatin, lime flavor)	M-25(2)	1	0.004	0.025	0.025

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes					
mg./100 gm.					
Beef (entree)					
Barbecued (in cubes) (30 lbs beef, boneless, diced in one- inch pieces; 1 lb flour; 4 lbs onions, dry, chopped; 6 1/2 cups tomato paste, canned)	L-18	1	0.061	0.135	0.105
Chili con carne with beans (4 lbs onions, dry, finely chopped; 4 lbs peppers, sweet, fresh, diced; 3 gals chili con carne, canned, without beans; 2 1/4 gals beans, kidney, canned)	L-59	1	0.055	0.110	0.132
Chili con carne without beans (same as above but without beans)	L-59	2	0.021 (0.014-0.028)	0.146 (0.143-0.150)	0.129 (0.108-0.150)
Corned, medium fat, simmered (time of simmering: about 5 hrs; internal temperature of corned beef: 180 to 200°F)	L-44	2	0.040 (0.033-0.046)	0.138 (0.126-0.150)	0.148 (0.138-0.157)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Beef (continued)					
Corned, hash (24 lbs corned beef, cooked, finely chopped; 6 lbs onions, dry, chopped; 24 lbs potatoes, white, fresh, cooked, diced; 1/2 gal stock, corned beef)	L-42	2	0.086 (0.086-0.087)	0.222 (0.221-0.222)	0.242 (0.231-0.252)
Ground, creamed (24 lbs beef, boneless, ground; 2 lbs flour; 3 qts milk, nonfat, dry; 10 tbsp soup and gravy base, beef)	L-30	3	0.143 (0.104-0.204)	0.205 (0.185-0.226)	0.098 (0.081-0.130)
Lasagna, baked (12 lbs beef, ground; 4 lbs onions, dry, chopped; 1 1/2 gals tomatoes, canned, crushed; 3 1/2 qts tomato paste, canned; 7 cups cheese, grated, Parmesan; 20 eggs, whole; 3 3/4 qts cottage cheese; 6 lbs noodles, lasagna)	L-25(2)	1	0.172	0.238	0.112

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Beef (continued)					
Liver, braised (analyzed without onions) (25 lbs beef liver, sliced, partially thawed; 2 lbs 4 oz flour; 8 lbs onions, dry, thinly sliced)	L-54	2	0.224 (0.148-0.300)	0.874 (0.689-1.060)	0.312 (0.172-0.452)
Loin roast (time of roasting: 3 hours)	L-5	1	0.046	0.230	0.410
Meatballs, Swedish (1 cup milk, nonfat, dry; 4 lbs bread, dry, broken; 3 cups onions, dry, chopped; 30 lbs beef, boneless, ground; 10 eggs, whole; 3 cups drippings; 1 lb 2 oz pastry flour; 2 gals stock, beef)	L-41(1)	5	0.107 (0.079-0.170)	0.149 (0.072-0.229)	0.185 (0.040-0.316)
Meat loaf (4 lbs bread, dry, broken; 1 qt onions, dry, finely chopped; 1 1/2 cups peppers, sweet, fresh, finely chopped; 3 cups celery, fresh, finely chopped; 30 lbs beef, ground; 12 eggs, whole)	L-35(2)	1	0.027	0.315	0.120

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Beef (continued)					
Minced (30 lbs beef, boneless, ground; 3 lbs onions, dry, chopped; 19 lbs 2 oz tomatoes, canned, crushed)	L-36	1	0.062	0.068	0.083
Pot pie (30 lbs beef, boneless, diced in 1 to 1 1/2-inch pieces; 1 lb 2 oz flour; 3 lbs onions, dry, finely chopped; 1 1/2 gals tomato juice, canned; 6 lbs carrots, fresh, 1/2-inch rings; 6 lbs potatoes, white, fresh, 1 to 1 1/2-inch pieces; 100 baking powder biscuits)	L-21(2)	1	0.186	0.130	0.188
Rib, roast, 70% lean (75 lbs beef, rib, RTC+ per 100 lbs beef carcass A.P.)	L-4	3	0.122 (0.099-0.166)	0.162 (0.078-0.291)	0.143 (0.071-0.237)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Beef (continued)					
Round, chicken fried (37 lbs 8 oz beef, boneless, Swiss steak, thawed; 4 lbs pastry flour; 1 1/3 cups milk, nonfat, dry; 20 eggs, whole)	L-12	1	0.192	0.222	0.074
Round, Swiss steak with tomato sauce (37 lbs beef, boneless, Swiss steak, thawed; 3 lbs pastry flour; 3 lbs onions, dry, chopped; 2 lbs peppers, sweet, fresh, chopped; 12 lbs 12 oz tomatoes, canned, crushed; 1 gal stock, beef)	L-16(1)	2	0.075 (0.066-0.084)	0.209 (0.196-0.223)	0.153 (0.130-0.175)
Sloppy Joe (barbecued beef sandwich, without bun) (30 lbs beef, ground; 6 lbs 8 oz onions, dry, chopped; 5 1/4 qts tomato catsup)	N-27	2	0.119 (0.098-0.140)	0.139 (0.137-0.140)	0.170 (0.115-0.224)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Beef (continued)					
27 Stuffed green peppers (6 1/2 qts tomato sauce; 21 lbs green peppers, sweet, fresh, large; 24 lbs beef, boneless, ground; 2 qts onions, dry, chopped; 1 lb 14 oz rolled oats)	L-40(1)	3	0.086 (0.055-0.122)	0.095 (0.070-0.125)	0.218 (0.016-0.336)
Sukiyaki (25 lbs beef, boneless, oven roast, partially thawed; 5 lbs onions, dry, finely sliced; 8 lbs celery, fresh, cut diagonally 1/8 inch thick; 3 lbs peppers, sweet, fresh, julienne; 5 lbs green onions, with tops, cut in 1 1/2 inch lengths; 1 lb mushrooms, canned, sliced, drained)	L-6(1)	1	0.035	0.166	0.237

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Chicken					
Cacciatore (2 lbs onions, dry, sliced; 1 lb peppers, sweet, fresh, chopped; 19 lbs 8 oz tomatoes, canned; 50 lbs chicken, broiler-fryer, cut-up; 3 lbs flour)	L-130	1	0.127	0.175	0.163
Fried (50 lbs chicken, broiler-fryer, cut-up; 4 lbs flour; time of frying: 5 to 15 minutes, in oven at 200°F)	L-137	1	0.216	0.231	0.127
Southern fried (same as for fried chicken above, except for time and temperature of frying: in 350°F oven about 45 minutes)	L-137-1	1	0.155	0.114	0.047

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Chicken (continued)					
Pot pie (45 lbs chicken, broiler-fryer, whole; 4 lbs potatoes, white, fresh, diced; 4 lbs carrots, fresh, sliced; 4 lbs 4 oz flour; 3 gals chicken stock; 6 lbs 8 oz peas, green, canned, drained; 1 2/3 cups milk, nonfat, dry; 20 eggs, whole)	L-132(1)	2	0.092 (0.062-0.121)	0.189 (0.122-0.255)	0.086 (0.067-0.105)
Pork					
Bacon slices, baked (slices drained thoroughly on absorbent paper)	L-2	1	0.766	0.266	0.149
Chop suey (32 lbs pork, diced, boneless; 3 1/2 cups soy sauce; 12 lbs onions, dry, sliced; 8 lbs celery, fresh, 1-inch pieces; 3 lbs cabbage, coarsely cut; 13 lbs bean sprouts, canned)	L-80(1)	2	0.389 (0.071-0.707)	0.156 (0.060-0.252)	0.207 (0.104-0.310)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
Pork (continued)					
Ham, fresh, 72% lean, roast (time of cooking: 5 hours at 325°F)	L-72	3	0.765 (0.669-0.873)	0.214 (0.144-0.279)	0.259 (0.147-0.367)
Ham steaks, fried (sliced into 5 oz with fat edge cut; grilled on lightly greased 350°F griddle for 3 minutes on each side)	L-65(2)-2	2	0.985 (0.641-1.330)	0.147 (0.136-0.158)	0.268 (0.266-0.270)
Loin, 68% lean, roast (time of cooking: 3 hours at 325°F)	L-81	1	0.953	0.263	0.268
Loin, barbecued (prebake meat for 2 hours at 350°F before adding sauce; then bake until internal temperature of the meat registers 170°F)	L-79(1)	3	0.884 (0.734-1.120)	0.142 (0.073-0.189)	0.281 (0.223-0.340)
Loin slices (pork chops), baked (32 lbs or 100 slices pork, boneless, tempered; 1 lb 12 oz pastry flour)	L-83	2	0.984 (0.947-1.020)	0.149 (0.144-0.153)	0.673 (0.504-0.841)

mg./100 gm.

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Pork (continued)					
Sweet and sour (10 eggs, whole; 32 lbs pork butt A.P., diced, boneless; 13 lbs bean sprouts, canned; 6 lbs 8 oz pineapple, canned, chunks; 1 3/4 gals pineapple juice; 2 lbs peppers, sweet, fresh, sliced)	L-82(1)	2	0.219 (0.115-0.322)	0.163 (0.095-0.230)	0.129 (0.097-0.161)
Sausage					
Frankfurters, grilled (grilled on lightly greased 375°F griddle for about 10 minutes)	L-63-1	1	0.194	0.119	0.138
Knockwurst, simmered (time of simmering: 10 minutes)	L-63-2	2	0.184 (0.037-0.330)	0.219 (0.158-0.280)	0.147 (0.057-0.236)
Pork, grilled (frozen, precooked)	L-91	2	0.481 (0.242-0.720)	0.224 (0.215-0.234)	0.378 (0.050-0.707)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
Sandwiches					
mg./100 gm.					
Cheeseburger with bun (weight of patties: about 3 oz each; each served with one slice cheese, American)	N-29	2	0.395 (0.291-0.498)	0.389 (0.238-0.539)	0.095 (0.061-0.129)
Grilled Reuben (16 lbs beef, corned; 12 lbs or 200 slices bread, rye; 3 qts sauerkraut, drained; 100 slices cheese, Swiss; 2 qts thousand island dressing)	N-20	1	0.346	0.305	0.161
Hamburger with bun (same as for cheeseburger above)	N-29	1	0.372	0.296	0.068
Roast beef (18 lbs beef, boneless, oven roast, cooked, chilled; 3 cups salad dressing; 12 lbs or 200 slices bread)	N-4	5	0.143 (0.077-0.209)	0.237 (0.168-0.373)	0.263 (0.145-0.385)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Sandwiches (continued)					
Submarine (25 lbs bread, French; 1 qt salad dressing; 21 lbs cold meat, ham, salami, bologna; 6 lbs cheese, American, processed, thinly sliced; 10 lbs tomatoes, fresh, thinly sliced; 3 lbs lettuce, fresh, trimmed, shredded)	N-19	2	0.438 (0.386-0.489)	0.351 (0.297-0.405)	0.059 (0.053-0.064)
Turkey					
A la King (45 lbs turkey, RTC; 2 2/3 cups milk, nonfat, dry; 3 gals stock, chicken; 2 lbs 8 oz pastry flour; 1 lb onions, dry, chopped; 5 lbs celery, fresh, chopped; 1 lb peppers, sweet, fresh, chopped; 1 3/4 cups pimientos, canned, chopped)	L-129(1)	2	0.075 (0.071-0.079)	0.175 (0.144-0.205)	0.253 (0.159-0.347)
Roast (65 lbs turkey, RTC; time of roasting: 6 hours at 325°F)	L-142(2)	1	0.056	0.243	0.227

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Veal					
Steaks, breaded (35 lbs or 100 slices veal, boneless, partially thawed; 2 lbs pastry flour; 3/4 cup milk, nonfat, dry; 10 eggs, whole; 3 lbs 8 oz bread crumbs, dry)	L-99	2	0.143 (0.143-0.143)	0.161 (0.161-0.161)	0.181 (0.125-0.237)
Steaks, Italian style (35 lbs or 100 slices veal, boneless, partially thawed; 2 lbs 4 oz pastry flour; 1 lb onions, dry, finely chopped; 2 lbs peppers, sweet, fresh, finely chopped; 12 lbs 12 oz tomatoes, canned, crushed; 4 oz parsley, fresh, chopped)	L-101	1	0.160	0.135	0.192
Fish					
Filletts, fried (30 lbs fish filletts, thawed, in 4 1/2 oz portions; 2 lbs bread crumbs, dry; 1 lb 12 oz pastry flour)	L-109	5	0.146 (0.050-0.311)	0.135 (0.074-0.172)	0.153 (0.037-0.379)

Table 1 - Continued
(page 30)

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Continued					
mg./100 gm.					
Fish (continued)					
Flounder, baked (time of cooking: about 25 minutes)	L-106(2)	1	0.127	0.127	0.079
French fried sticks (fish sticks, frozen) (fish sticks, frozen, breaded; fried in deep fat at 350°F for 3 minutes)	L-111-2	1	0.362	0.257	0.169
Salmon cakes (20 lbs salmon, canned; 4 lbs potatoes, white, instant; 3/4 cup milk, nonfat, dry; 1 1/4 gals water and salmon juice; 20 eggs, whole, beaten; 12 oz onions, dry, chopped; 1 lb flour)	L-114	1	0.205	0.168	0.711
Shrimp, French fried (20 lbs shrimp, frozen, raw, peeled, deveined; 4 lbs pastry flour; 20 eggs, whole; 3 lbs bread crumbs, dry)	L-121(2)	1	0.082	0.101	0.015

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Meats and Fishes - Concluded					
mg./100 gm.					
Fish (continued)					
Tuna and noodles, baked (20 lbs tuna, canned; 6 lbs noodles; 3 lbs milk, nonfat, dry; 1 lb 12 oz pastry flour; 5 lbs celery, sliced thin; 12 oz onions, dry, chopped; 14 oz pimientos, canned, drained, chopped; 1 lb bread crumbs, dry)	L-124(1)	1	0.035	0.086	0.051
Miscellaneous					
mg./100 gm.					
Carbonated drink					
Cola		1	0.000	0.000	0.000
Fruit flavor		1	0.000	0.000	0.000
Root beer		1	0.000	0.000	0.000

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Miscellaneous - Concluded					
			mg./100 gm.		
Gravy, brown (1 lb 8 oz meat dripping and clear fat; 1 lb 8 oz pastry flour; 2 gals stock, beef)	0-16(1)	1	0.037	0.036	0.001
Soups					
Beef barley (3 lbs or 1 1/2 qts barley per 6 1/4 gals beef stock; 25 lbs beef bones, cracked; 10 lbs beef trimmings; 1 lb carrots, fresh, chopped; 1 lb celery, fresh, chopped; 1 lb onions, dry, chopped)	P-1-1	2	0.027 (0.024-0.030)	0.039 (0.019-0.059)	0.014 (0.011-0.016)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Soups - Continued					
mg./100 gm.					
Beef noodle (1 lb noodles, canned, per 6 1/4 gals beef boiling stock)	P-1-2	1	0.000	0.030	0.005
Beef vegetable (2 lbs onions, dry, chopped; 2 lbs carrots, fresh, chopped; 2 lbs celery, fresh, chopped; 8 oz peppers, sweet, fresh, chopped; 3 lbs potatoes, white, fresh, diced; 2 lbs cabbage, fresh, chopped; 12 lbs 12 oz tomatoes, canned, crushed; 4 1/4 gals beef stock)	P-7(1)	1	0.120	0.066	0.097
Chicken noodle (1 lb noodles, canned, per 6 1/4 gals turkey stock: turkey bones from 65 lbs RTC issue; 4 lbs celery, fresh stalks, leaves, large pieces; 8 lbs onions, dry, whole)	P-2-1 P-2 E-4	1	0.002	0.054	0.012

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Soups - Continued					
mg./100 gm.					
Clam chowder, Manhattan style (12 lbs clams, canned, chopped, drained; 12 oz bacon, chopped; 2 lbs onions, dry, chopped; 2 lbs celery, fresh, diced; 1 lb 8 oz peppers, sweet, fresh, chopped; 4 lbs 8 oz potatoes, white, fresh, diced; 1 lb 8 oz carrots, fresh, diced; 12 lbs 12 oz tomatoes, canned, crushed)	P-12-1	2	0.036 (0.030-0.042)	0.025 (0.022-0.028)	0.054 (0.046-0.063)
Minestrone (4 gals beef stock; 2 lbs potatoes, white, fresh, diced; 6 lbs 8 oz toma- toes, canned, crushed; 2 lbs cabbage, fresh, chopped; 8 oz peppers, sweet, fresh, chopped; 2 lbs carrots, fresh, chopped; 2 lbs celery, fresh, chopped; 2 lbs onions, dry, chopped; 2 lbs beans, green, canned, drained; 3 lbs beans, kidney, canned, drained; 1 lb 8 oz macaroni)	P-7(1)-1	1	0.056	0.056	0.050
Oyster stew (18 lbs oysters, with liquid; 2 3/4 qts milk, nonfat, dry; 3 1/2 gals water)	P-21	2	0.035 (0.022-0.048)	0.121 (0.118-0.124)	0.024 (0.016-0.033)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Soups - Concluded					
			mg./100 gm.		
Split pea (9 lbs peas, dry, split; 16 oz soup and gravity base, ham; 2 lbs ham trimmings, diced; 2 lbs onions, dry, ground; 1 lb 2 oz carrots, fresh, grated)	P-23	1	0.054	0.030	0.021
Tomato-vegetable (4 lbs or 4 No. 2 1/2 cans soup, dehy- drated, tomato-vegetable with noodles, per 6 1/4 gals boiling water)	P-26	1	0.024	0.035	0.058
Vegetables					
			mg./100 gm.		
Asparagus, buttered (frozen; buttered after boiled and drained)	Q-G-3	3	0.065 (0.025-0.099)	0.103 (0.080-0.134)	0.020 (0.012-0.025)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
mg./100 gm.					
Beans					
Green, buttered (canned; buttered after boiled and drained)	Q-G-1	1	0.031	0.034	0.011
Lima, buttered (frozen; buttered after boiled and drained)	Q-G-3	1	0.010	0.061	0.037
Yellow wax, buttered (frozen; buttered after boiled and drained)	Q-G-3	3	0.053 (0.035-0.081)	0.053 (0.039-0.071)	0.029 (0.016-0.041)
White, baked (2 lbs 8 oz bacon, chopped; 2 lbs onions, dry, chopped; 34 lbs 6 oz beans, white, canned with pork in tomato sauce; 2 1/2 cups tomato catsup)	Q-2	3	0.153 (0.124-0.170)	0.060 (0.046-0.085)	0.134 (0.105-0.170)
Beets, Harvard (canned)	Q-8	1	0.044	0.038	0.016

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
mg./100 gm.					
Broccoli, buttered (frozen; buttered after boiled and drained)	Q-G-3	1	0.036	0.094	0.085
Brussels sprouts, buttered (frozen; buttered after boiled and drained)	Q-G-3	3	0.088 (0.072-0.104)	0.117 (0.094-0.134)	0.301 (0.206-0.435)
Cabbage, buttered (fresh; buttered after boiled and drained)	Q-G-2	1	0.057	0.055	0.113
Cauliflower, French fried (1 1/3 cups milk, nonfat, dry; 20 eggs, whole; 20 lbs cauliflower, partially thawed; 2 lbs pastry flour; 1 qt cheese, grated, Parmesan)	Q-20	2	0.071 (0.064-0.078)	0.100 (0.074-0.126)	0.057 (0.044-0.070)
Corn					
On-the-cob, buttered (frozen, 100 ears; buttered after boiled and drained)	Q-G-3	3	0.174 (0.127-0.222)	0.069 (0.067-0.071)	0.224 (0.062-0.475)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
mg./100 gm.					
Corn (continued)					
Scalloped cream style (19 lbs 14 oz corn, canned, cream style; 1 1/8 cups milk, nonfat, dry; 4 qts crackers, soda, coarsely crumbled)	Q-23	1	0.050	0.100	0.026
Whole grain, buttered (canned; buttered after boiled and drained)	Q-G-1	1	0.080	0.100	0.083
Whole grain, buttered (frozen; buttered after boiled and drained)	Q-G-3	1	0.053	0.109	0.097
Lettuce, Iceberg, New York		1	0.026	0.041	0.027
Onions					
Fried, in fat (dry, thinly sliced; time of frying: about 40 minutes at 400°F)	Q-36	1	0.068	0.119	0.116

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
mg./100 gm.					
Onions (continued)					
Rings, French fried (flour method) (20 lbs onions, dry, cut into slices, 1/2-inch thick; 8 lbs pastry flour)	Q-35(2)	1	0.152	0.148	0.060
Peas, buttered (green, canned; buttered after boiled and drained)	Q-G-1	1	0.090	0.041	0.051
Peas, buttered (green, frozen; buttered after boiled and drained)	Q-G-3	2	0.499 (0.465-0.534)	0.083 (0.077-0.089)	0.109 (0.073-0.145)
Peas with carrots (12 lbs peas, green, frozen; 7 lbs carrots, fresh, sliced)	Q-41-1	1	0.225	0.064	0.087
Potatoes					
Baked in skin (analyzed without skin) (white, fresh, A.P.; time of baking: 1 hour)	Q-44	2	0.117 (0.094-0.140)	0.055 (0.050-0.059)	0.138 (0.104-0.172)

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
Potatoes (continued)					
Boiled without skin, buttered (white, fresh; buttered after boiled and drained)	Q-G-2	1	0.046	0.046	0.337
French fried (white, fresh, French fry cut; cooked at 365°F in deep fat for 7 minutes)	Q-45	1	0.172	0.027	0.178
Hashed brown (white, fresh, quartered; cooked at 400°F until golden brown)	Q-46	2	0.238 (0.153-0.322)	0.038 (0.025-0.050)	0.272 (0.206-0.338)
Mashed (35 lbs potatoes, white, fresh, quar- tered; 2 1/4 cups milk, nonfat, dry)	Q-48	1	0.000	0.031	0.166
O'Brien (35 lbs potatoes, white, fresh, 3/4- inch cubes; 3 cups peppers, sweet, fresh, finely chopped; 1 cup pimientos, canned, drained, finely chopped)	Q-49	1	0.017	0.047	0.189

mg./100 gm.

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
mg./100 gm.					
Potatoes (continued)					
Oven browned (white, fresh, halved; cooked at 400°F until browned)	Q-50	3	0.142 (0.034-0.255)	0.045 (0.040-0.053)	0.304 (0.225-0.352)
Scalloped, with cheese (35 lbs potatoes, white, fresh, 1/4- inch slice; 2 1/4 cups pastry flour; 4 1/3 cups milk, nonfat, dry; 1 cup cheese, ground)	Q-53	1	0.034	0.059	0.054
Scalloped, without cheese (same as for with cheese above)	Q-53	1	0.064	0.045	0.058
Salads					
Carrot (10 lbs carrots, fresh, ground; 5 lbs celery, fresh, diced; 1/2 cup milk, nonfat, dry; 1 1/4 qts salad dressing)	M-5(2)	1	0.060	0.058	0.084

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
Salads (continued)					
57 Chef's, with lunch meat and cheese (6 lbs lettuce, fresh, Iceberg, trimmed; 1 lb cabbage, fresh, shredded; 2 lbs peppers, sweet, fresh, diced 1/2-inch; 3 lbs celery, fresh, diced 1/4-inch; 2 lbs cucumbers, fresh, pared, sliced 1/8-inch; 2 lbs lunch meat, cold ham, canned; 2 lbs cheese, American; 29 eggs, hard cooked, wedges; 6 lbs tomatoes, fresh, wedges)	M-7(1)	4	0.095 (0.070-0.135)	0.060 (0.031-0.092)	0.088 (0.047-0.130)
Coleslaw with creamy dressing (3/4 cup milk, nonfat, dry; 1 qt salad dressing; 12 lbs cabbage, fresh, finely shredded)	M-9	6	0.066 (0.049-0.120)	0.062 (0.037-0.138)	0.126 (0.054-0.309)
Cottage cheese (1/4 cup cottage cheese per lettuce leaf, fresh, trimmed, Iceberg)		1	0.025	0.170	0.013

mg./100 gm.

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
mg./100 gm.					
Salads (continued)					
Kidney bean (1 1/2 qts salad dressing; 23 lbs beans, kidney, canned; 3 lbs celery, fresh, thinly sliced; 20 eggs, hard cooked, chopped; 2 1/4 cups onions, dry, thinly sliced; 1 lb peppers, sweet, fresh, thinly sliced; 2 lbs relish, pickle, sweet)	M-31	7	0.109 (0.066-0.122)	0.138 (0.010-0.223)	0.036 (0.020-0.100)
Potato (20 lbs potatoes, white, fresh, cooked; 1 lb onions, dry, finely chopped; 4 lbs celery, fresh, chopped; 24 eggs, hard cooked, chopped; 1 lb pickles, cucumber, sweet, finely chopped; 1/2 cup parsley, fresh, chopped; 2 qts salad dressing)	M-40(1)	2	0.127 (0.088-0.166)	0.108 (0.067-0.148)	0.141 (0.059-0.223)
Sliced cucumber and onion (15 lbs cucumbers, fresh, pared, sliced, 1/8-inch; 3 lbs onions, dry, sliced, 1/8-inch)	M-15	1	0.027	0.024	0.043

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
Salads (continued)					
Tossed green (2 lbs endive, fresh, trimmed; 3 lbs romaine, fresh, trimmed; 6 lbs lettuce, Iceberg, fresh, trimmed)	M-47	7	0.065 (0.050-0.107)	0.035 (0.028-0.049)	0.050 (0.034-0.060)
Spinach, buttered (canned; buttered after boiled and drained)	Q-G-1	1	0.004	0.106	0.108
Spinach, buttered (frozen; buttered after boiled and drained)	Q-G-3	5	0.048 (0.016-0.105)	0.148 (0.096-0.322)	0.140 (0.050-0.268)
Squash, buttered (fresh, summer; buttered after boiled and drained)	Q-G-2	3	0.040 (0.032-0.051)	0.033 (0.020-0.043)	0.036 (0.019-0.061)
Succotash, buttered (10 lbs beans, lima, frozen; 10 lbs corn, frozen, whole grain; 1 cup parsley, fresh, chopped; buttered after boiled and drained)	Q-65	2	0.168 (0.160-0.176)	0.097 (0.053-0.140)	0.116 (0.099-0.133)

mg./100 gm.

Table 1 - Continued

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Continued					
Sweet potatoes, with marshmallows (1 1/3 cups milk, nonfat, dry; 22 lbs 8 oz potatoes, sweet, canned; at end of baking time topped with 1 lb marshmallows, miniature)	Q-69	2	0.021 (0.018-0.023)	0.048 (0.028-0.068)	0.059 (0.049-0.069)
Tomato(es)					
Juice		2	0.068 (0.050-0.085)	0.034 (0.020-0.048)	0.132 (0.109-0.154)
Raw, ripe		1	0.047	0.036	0.030
Seasoned (ripe, canned; seasoned after boiled and drained)	Q-C-1	2	0.073 (0.060-0.085)	0.022 (0.015-0.030)	0.138 (0.099-0.176)
Scalloped (1 lb 8 oz bread, toasted, cut in 1/2- inch cubes; 25 lbs 8 oz tomatoes, canned)	Q-72	2	0.071 (0.056-0.086)	0.041 (0.026-0.056)	0.066 (0.050-0.081)

Table 1 - Concluded

FOOD ITEM AND DESCRIPTION	REF. TO RECIPE	NO. OF SAMPLES	THIAMIN	RIBOFLAVIN	VITAMIN B-6
Vegetables - Concluded					
mg./100 gm.					
Turnips, green, buttered (frozen; buttered after boiled and drained)	Q-G-3	1	0.054	0.074	0.067
Vegetables, mixed, buttered (frozen; buttered after boiled and drained)	Q-G-3	2	0.072 (0.048-0.095)	0.120 (0.088-0.152)	0.075 (0.061-0.088)

*Time lapse between foods prepared and foods served ranges from 30 minutes to 1 1/2 hours.

†Only major (weight- or portion-wise) ingredients and those with potential B-vitamins are included in the description. Most ingredient quantities cited above are on the basis of 100 servings. Abbreviations used in the table are as follows: A.P. - as purchased; RTC - ready-to-cook.

‡All recipes (source: Armed Forces Recipe Manual, 1969) are prepared by the Department of the Defense, U.S.A.; upon request, recipe manual may be obtained from the following organization:

Departments of the Army, the Navy, and the Air Forces
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